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The want of a correct statistics of railroads in the United States, and the outrageous assertions recently made in our legislative halls, as to their unprofitableness, have had the effect of prejudicing the minds of a large portion of the community against this most valuable species of improvement. "Speculations," "losing concerns," "public evils," and similar catch words have been repeated and dwelt upon, until even the partizans of the anti-improvement system, have found themselves carried to conclusions which they would fain modify and explain away.

It is but too commonly considered that the estimates of Engineers are ex parte statements, requiring a liberal allowance for prejudice in favor of railroads.

We have, however, now before us, a carefully prepared paper, from a distinguished and unprejudiced foreigner, the Chev. de Gerstner, which must give the highest satisfaction to the friends of internal improvement. Since the arrival of the Chev. de Gerstner, he has collected an immense mass of railroad information, hitherto never yet possessed by any one person.

With his previous preparation, he may now be considered as the only one who has ever yet visited nearly, or perhaps before long, quite, all of the railroads in the world. We hope that every encouragement may be offered to him to publish this, to us, invaluable information. Nothing can have a more favorable effect upon the reputation of our railroads abroad, than such a publication, and it will be to the interest of capitalists, engineers, and all connected with railroads, to aid in forwarding it.

Before we received the communication of the Chev. de Gerstner, we received from Mr. G. Ralston, a file of the Railway Times, to an article in which, he directed our attention, as worthy of notice. The article in question, is a comparison of the English and Belgian railroads, and particular attention is paid to the subject of low rates of fare, as the most profitable. We give on another page, the article referred to with an extract from the letter of Mr. R.

For the American Railroad Journal, and Mechanics' Magazine.

METEOROLOGICAL RECORD FOR THE MONTHS OF MARCH and APRIL, 1839.

Kept on Red River, below Alexandria, La., (*Lat.* 31.10 *N.*, *Long.*, 91.59 *W*)

1839	Thermometer.					
Mar.	Morn.	Noon.	Night	Wind.	Weath.	Remarks.
1	49	73	68	S	clear	
2	59	66	54	SE	cloudy	rain in the morning, evening clear, wind NW
3	27	36	33	N	clear	[high
4	27	35	39	..	..	
5	27	54	46	calm	..	white frost, foggy morning]
6	32	56	56	..	..	white frost, night cloudy
7	52	68	60	..	cloudy	morning, clear day
8	48	65	54	..	clear	foggy morning
9	50	73	64	S	..	" " "
10	54	74	68	..	..	
11	60	75	66	..	..	
12	63	77	71	SE	..	
13	67	70	66	calm	cloudy	heavy thunder shower in the evening
14	51	51	55	SW	..	evening clear
15	45	70	65	NE	clear	
16	48	72	65	SE	..	
17	58	70	66	calm	cloudy	foggy morning
18	63	72	68	SW	..	
19	66	72	68	..	..	light shower in the evening
20	68	75	74	S	clear	
21	68	73	72	calm	cloudy	rain in the night
22	68	64	63	NE	..	thunder showers forenoon
23	52	64	63	NW	clear	
24	54	70	66	.. light	..	foggy morning
25	55	65	56	..	..	
26	44	68	64	calm	..	
27	57	68	68	S	cloudy	
28	67	73	69	..	..	light showers all day, rain all night
29	62	67	61	..	..	heavy showers all day, night clear, wind N
30	46	60	52	NW	clear	
31	42	66	64	N	..	light white frost
	53.8	66	61.4	.....	.....	mean temp. of the month 60.4.
Apr.						
1	45	70	62	S	clear	
2	51	70	66	SE	..	
3	60	69	66	..	cloudy	
4	57	76	72	S	..	
5	63	77	70	SE	..	
6	62	73	63	calm	..	rain in the evening and all night
7	60	74	64	SE	..	
8	60	73	72	calm	clear	
9	56	78	73	S	..	
10	67	74	72	..	cloudy	light showers in the evening
11	66	80	72	SW	clear	
12	58	82	76	..	..	
13	56	74	70	..	..	
14	57	75	68	W	..	
15	55	82	74	..	..	
16	62	82	72	SW	..	
17	62	78	68	..	..	foggy morning
18	62	78	76	..	..	" "
19	70	80	78	..	..	morning cloudy
20	70	79	74	..	..	
21	63	80	74	calm	..	foggy morning
22	66	82	80	..	..	
23	66	86	82	SW	..	
24	77	84	78	..	..	
25	65	82	76	SE	..	
26	66	84	80	..	..	
27	67	84	75	SW	..	
28	68	80	74	..	..	
29	67	80	76	S	..	morning cloudy
30	66	78	76	..	..	" "
	52.3	78.1	72.6	.....	.....	mean temp. of the month, 71.

For the American Railroad Journal and Mecnanics' Magazine.

MESSRS. EDITORS:—I have read the essays of X., in relation to the Reading Railroad, addressed to E. Chauncy, Esq. with great interest. He gives us the long desired data to come out, "*Railroads v. Canals.*"—On this subject, it is high time we took ground. The public have been led astray by the engineers, both in England and the United States, from mutual success with canals in the first instance. In this State we have carried the canal mania to an extent that will cost us upwards of $20,000,000, *actually thrown away*, viz. in the enlargement of the Erie Canal, in the construction of the Chenango, Black River, and Genesee Valley Canals, constructed in sections of the country not adapted to canals, but eminently suited to railroads, and the extension of railroads, to points where there is not water to continue these canals. Our State, in 1835, adopted the errors and prejudices of English engineers, collected of the chairman of the committee on canals in congress, to prove the importance of the Chesapeake and the Ohio canal, and the advantages that work would have over a railroad.

If I recollect, a railroad was placed as middle ground, between a common road and a canal—viz. in the relation of a turnpike, to these improvements. The state engineers of New York placed the actual *cost* of transporting a ton a mile on a level railroad at 3½ cents per mile. This opinion, coming from such a source, with the sanction of a highly respectable canal board, and in an official report, carried the laws for the construction of the before named canals, and has retarded railroads full ten years in this State, whilst our neighbors to the east and south, have pushed them forward with vigor.

The essays alluded to, presents the following comparison between the Philadelphia Reading *Railroad* and the Schuylkill *Canal*, as to the actual cost of transporting a ton of coals from the mines to tide water at Philadelphia, for the minute details of which, I refer you to the essay you were so good as to furnish me. The entire publication of these essays will add much to the cause of railroads.

"The present cost of transporting one ton of coal 108 miles to the Schuylkill, which includes 92 cents toll, the present charge is	$3 23 1-2
The total cost per ton for freighting and shipping by the Reading Railroad, 94 miles to the Delaware river, is 78 3-4, add toll, 1-2 cent per ton per mile, 47, - - - - -	1 25 3-4
Difference in favor of the Railroad, - - - - -	1 97 3-4

By this view of the subject, it appears that one of our best constructed canals, receives 3 1-4 cents per ton per mile, whilst the rail road along side of it, proposes to do the same business at 1 1-4 cents per ton per mile. This may be too low, but they certainly can compete with the canal.

That there is fear, that the Utica and Schenectady rail road, can compete with the Erie canal in the transportation of goods and produce, *even paying canal tolls!!* is evinced, by the last legislature refusing that com-

pany to carry freight during the summer, but restricting them to the winter months, then to pay canal tolls. Of course the company cannot go to the expence of freight cars, &c., for so short a period, on such onerous terms.

J. E. B.

Correction.—In the table furnished us by J. E. Bloomfield for our June number, stating the cost, expenses and income of the three principal roads in Massachusetts, also of the Utica and Schenectady railroad in this State for the last year, the nett per centage earned, was blended in the column with the cost of the several roads, instead of being placed in a seperate column.

The Boston and Lowell road earned nett,	.	.	7 1-3 per cent.
" Boston and Providence,	" " .	. .	8 1-4 " "
" Boston and Worcester,	" " .	. .	8 " "
" Utica and Schenectady,	" " .	. .	12 " "

It has been ascertained by the Chevalier De Gerstner, that the average cost of 3000 miles of railroads, completed in the United States, is about $20,000 per mile, and that the average nett income, in their presept incipient state, and sparce population, yields 5 1-2 per cent. on the cost.

For the American Railroad Journal and Mechanics' Magazine.

LONDON, May 28, 1839.
No. 7, Token House Yard.

GENT:—I Send you the "Railway Times" of the 18th inst., with the view of requesting you to republish in your excellent "American Railroad Journal," a very sensible article headed "Railway fares," wherein the impolicy of high charges on railways, and the policy and profits of low charges are clearly pointed out. My opinion is, that in a populous country the lower you can reduce the expenses of locomotion, consistent with reason, the larger will be the profits of the railway proprietors, and the more extensive, of course, will be the benefits of this invaluable species of improvements, diffused through the community. This remark applies particularly to countries like Belgium and Great Britain, and to parts of our own country—say, for example, from Boston to Washington, including Providence, New York, Philadelphia, and Baltimore, where the travelling is exceedingly great, and will be made infinitely greater by low fares. I think the fares on our American railways are too high, and sound policy will dictate a considerable reduction of them. By publishing the excellent article I point out to you, the attention of the Directors of our public works in the United States, may be attracted to the subject, and the evil may be remedied.

The extension of the railway system in this country, is very rapid, but nothing in comparison with what is done and doing in our country. If we had some more of the spare capital of this country, we could show the good people of Europe how to make these improvementr rapidly. They

move on very slowly in this country, having lawyers, parliament, and the landed aristocracy, to throw every possible impediment in the way, and to make them pay the most exorbitant prices for land, &c., whilst in America, Government and individuals give all possible facilities to the erection of these admirable labor saving machines, and the result is, whilst their principal railways cost from 50,000 to 70,000*l* per mile, and are treble the time in progress that ours are, our railways cost on an average, 8,444*l** per mile, and are frequently completed, before an act of parliament can be procured to authorize the commencement of the work in this country. It is to be hoped that the vexations attending these important works will be removed, as their value becomes more generally known.

I was rejoiced to learn that the Birmingham and Glocester Railway Company of this country, had ordered some locomotives to be made for them by Mr. Norris, of Philadelphia. I am also highly gratified to hear that several railway companies in Germany have ordered a considerable number of these machines from our country. I sincerely hope they will turn out such excellent instruments, that a continuance of these orders will flow in to our ingenious and skilful mechanics in the United States.

RAILROADS IN THE KINGDOM OF BELGIUM COMPARED WITH THOSE IN THE UNITED STATES.

The rapid increase of Internal Improvements in the United States has excited for several years public attention in Europe, and the friends of those improvements desired very much a detailed report on the extent and progress of those works, and particularly of *Railroads* There is no such report furnished in the United States, and even those published in England, France, and Germany are very imperfect.

In 1824 I had charge of the first railroad on the continent of Europe to connect the rivers Moldau and Danube in Austria, by a line which is 130 miles long, and since 1832 in operation. I constructed in 1836 and 1837 the first railroad in Russia, from St. Petersburg to Zarskoe-Selo and Pawlowsk, a line of only 17 miles in length, but the commencement of a railroad of 420 miles from St. Petersburgh to Moscow. This railroad being likewise in full operation, I left Europe last fall, and arrived in the Great Western on the 15th of November, 1838, at New York. After a short stay of a few days I went to Albany, and inspected all railroads between that place and Lake Erie; I then proceeded to the Eastern States, and visited all railroads in Massachusetts, and went via New York, Philadelphia, Baltimore, Washington, through Virginia, North and South Carolina, Georgia, and Alabama, to New Orleans, always visiting the railroad lines in the different States. I went then up the Mississippi and Ohio, and am now inspecting the internal improvements of the Western States, and some of those in Pennsylvania, which I have not yet seen.

I have already passed over more than 2000 miles of railroads, and have every where been received with the greatest kindness; the presidents, directors, and engineers of the different railroad lines gave me not only all their printed reports, but laid before me, with the greatest liberality, their

*See Report in your March number, page 178, of the Housatonic Railway Company, where the average cost of twelve principal American Rail Roads is stated to be $38,000 or £8,444. G. R.

books and accounts, in order to give me every kind of information. I fulfil only my duty when I publicly acknowledge, that such a liberality is only to be found amongst a free and enlightened people, where all public works are based on the principle of publicity, and where secrets do not exist. I wish, therefore, to make those gentlemen, to whom I am so much indebted, another communication, which will show at the same time what has been done during the last years in Europe. Having within a few days received the last reports of the Belgian railroads, I publish in the following abstract the history and progress of those communications in Belgium, together with a comparison of them with the American railroads.

According to the facts collected during my travels since my arrival in New York, there are now *over three thousand miles of railroads completed and in operation in the United States;* 425 locomotives, of which the greatest number were made in this conntry, run on the several railroads, and I believe that up to the end of 1839, the length of railroads in the United States may amount to 4100 miles. The capital expended on the railroads now in operation is about sixty millions of dollars, or at an average cost of twenty thousand dollars per mile, for which sum the railroads, with the buildings, have been constructed, and the necessary locomotives and cars bought.

Several railroads have been undertaken with insufficient means, and the shareholders found themselves under the necessity of employing the income of the first years in improving the railroad, in building engine houses, &c. and purchasing locomotives and cars. In consequence of this the shareholders got during that time no dividends, but the railroad still yielded a good income. Other railroads, when finished, paid from five to ten per cent. income to the stockholders; others have not yet paid any dividends, for want of a sufficient number of passengers and freight. The *average result* of the railroads now in operation in the United States is, *that they give a yearly interest of five and a half per cent. on the capital invested.* This result may be regarded as very satisfactory, because the greatest part of the lines have only been a few years in operation.

On all lines there is a yearly increase of at least 15 to 20 per cent. in the gross income, so that even those lines which do not pay now will give in a few years a handsome dividend. According to these statements, based on the communications collected in this country, I have no doubt that the large capital invested in railroads in the United States, will not only produce an incalculable benefit to the country, but also pay the shareholders a dividend, which, under good management, by the constant progress in population and trade, must likewise from year to year increase.

A good book-keeping and clear accounts is in every business a matter of importance; railroads are new constructions, and experience particularly in working them, is still very much wanted. When the superintendent of a railroad in operation keeps clear and distinct accounts, he will in a few years learn by experience what can be improved, and which items of expenses can be reduced. The following statement contains a manner of making the railroad accounts, which in my opinion must prove very useful for every railroad company.

I. *History, length, and cost of construction of the Belgian Railroads.*

The railroads, which, up to the present time, have been constructed in England and on the continent of Europe, had no other object than to connect two important places of the country, and in constructing them, therefore, only a local interest more or less prevailed. That railroads are to be considered *as great thoroughfares,* that they can form in a country the

principal lines of internal communication—that, therefore, the means for their establishment should be such as can only be raised by a whole nation, nobody in Europe would maintain previous to the year 1834, and is even now denied by many persons of high standing and influence. Belgium, united with Holland since 1815, had distinguished itself in Europe by its fine roads, and magnificent canals; the latter, being constructed for the greatest part in a level country, and without locks, were used not only for the transportation of goods, but for passengers, especially the lower classes, which there, more than in any other country, made use of the canal boats for their travels. It is evident, that no individuals would ever have attempted to construct railroads parallel and in opposition to such canals and turnpike roads.

In the year 1830, Belgium declared itself independent of Holland, and elected by the representatives of the nation its own sovereign. King Leopold I. soon discovered, that the country, for its perfect tranquility, wants "labor;" a series of wise legislation encouraged the nation to useful and profitable enterprizes, and every person with talent and inclination found employment and earnings in a country, which, isolated from its neighbors, was confined to its own resources. But to gain the public opinion, a great national work was to be accomplished by the new government, able to fill posterity with admiration. The time was past for Egyptian pyramids, for Roman triumphal arches, and French monuments of war. A more useful monument, one of peace and intelligence, should remind the nation of that eventful period. The king ordered the whole country to be surveyed by able engineers, the necessary plans and estimates formed, and on the first of May, 1834, a law was proclaimed, according to which *a system of railroads should be introduced through the whole kingdom, and executed at the expense of the State;* on two points, (at Antwerp and Ostend.) the railroads were to lead to the seaports, on two points to connect with France, and on one point to connect with Prussia, (Germany.)

The news of the gigantic work, undertaken by a State, even not yet acknowledged as such by the Northern powers, and with only four millions of inhabitants, excited the greatest surprise in Europe, and few only could conceive the great results, which this grand project must necessarily produce *on the independence of the nation and its internal welfare*, its commerce and industry; the former being the principal aim and the promotion of commerce and industry a subordinate one, although the great mass of the people were unable to comprehend the grand idea of the plan.

King Leopold found in his former minister of public works, Mr. De Theux, and in his successor Mr. Nothomb, vigorous supporters. The Engineers were vying in the swift prosecution of the work, and in the course of four years, more has been done than was expected. The enlightened minister Nothomb published annual reports to the Legislative Assembly, besides other special reports of the progress of the works, in which the public in Europe find a rich source of experience, not to be met with in any report or work on the subject. Europe has to render thanks to the King, who the first realized such a grand idea, and to his enlightened minister, who judiciously conducted the work, and so liberally communicated its results.

The limited space of this report does not allow a detailed extract from the above mentioned reports of the minister Nothomb and the Engineers, I shall therefore only give a brief account containing the results in numbers, and afterwards compare these results with those of Railroads in the United States. The following table contains the sections of the Railroads

which were opened until the end of 1838, and their length in mètres and English miles.

Section of Railroads. From	To	Time of opening.	Length. In French mètres.	In English miles.
Brussels,	Malines,	5 May, 1835,	20,300,	12.6
Malines,	Antwerp,	3 May, 1836,	23,500,	14.6
Malines,	Termonde,	2 Jan., 1837,	26,700,	16.5
Malines,	Louvain,	10 Sept., 1837,	23,750,	14.7
Louvain,	Tirlemont,	22 Sept., 1837,	17,745,	11.0
Termonde,	Gent,	28 Sept., 1837,	30,500,	18.9
Tirlemont,	Waremme,	2 April, 1838,	27,200,	16.8
Waremme,	Ans,	2 April, 1838,	18,900,	11.7
Gent,	Bruges,	12 Aug., 1838	44,500,	27.6
Bruges,	Ostend,	28 Aug., 1838,	23,500,	14.6
		Total,	256,600,	159.0

According to the report, made by the minister to the House of Representatives, on the 26th November 1838, the above ten sections including buildings, locomotives and cars, cost 34,000,000 francs; this gives per mile of Road 41,300 dollars. The Railroad from Brussels to Antwerp, 27.2 miles, has a double track, the remainder are constructed only with a single track, the rails weighing 45 lbs. per yard. But there are several buildings yet to be erected, and different works on the line to be executed, and besides a number of freight cars to be provided for, &c.; with all this the cost per mile will amount to 45,000 dollars.

II. *Tariff For Passengers, Speed.*

There are on the Belgian railroads four classes of passenger cars, differing only in elegance and comfort, but going in the same train, and therefore with equal velocity. The prices are:

In the Berlines,	2⅓ cents per mile,	For each passenger with 44 lbs. of baggage.
" Diligences,	2 " " "	
" Chars à Bancs,	1⅓ " " "	
" Waggons,	0.8 " " "	

The trains perform at an average 17 Eng. miles per hour, all stoppages included, or from 20 to 25 miles while running.

III. *Traffic and Revenue of the BelgianRailroads.*

The railroads in Belgium are frequented by more passengers than any other Railroads; the transportation of freight was only begun between Brussels and Antwerp, in 1838. The following table shows the travel since the opening of the first section, until the 31st of October, 1838.

Period.	Total number of passengers.	Average distance performed by each passenger.	Number of passengers reduced for one mile.	Gross income. From all passengers.		per passengers. per mile.
		Miles.		Francs.	Dollars	Amer. cts.
5th May 1836 to 2d May 1836	563,201	11.6	6,536,754	359,394	67,429	1.03
3d May to 31st Dec. 1836.	729,545	20.2	14,718,709	734,736	137,849	0.90
In the year 1837,	1,384,577	17.2	23,838,436	6,416.983	265,850	1.11
1st Jan. to 31st Oct. 1838,	1,921,619	22.8	43,887,864	2,589,384	485,813	1.11
In 3 years 6 months,	4,598,942	19.35	88,981,763	5,100,497	956,941	1.07

to which must be added 44,148 francs, or 8,281 dollars, as the gross income from freight in the year 1838.

In the year 1837 there were 30,857 soldiers under the number of passengers, for whom, in consequence of an arrangement with the ministry of the War Department, only half price was paid.

In 1838, the total number of passengers amounted, according to the "Moniteur Belge," to 2,238,303, comprising 56,618 soldiers, and the gross income was 3,100,833 francs 40 centimes [581,770 dollars.] As the average distance performed by each passenger in the first 10 months of 1838, is not mentioned in the report of the Minister, I supposed the income per passenger per mile to be the same as in 1837, out of which results an average distance of 22.8 miles. In order to show how the travelling public made use of the different classes of cars, the following contains the number of passengers in each class of cars, and the revenue resulting therefrom for the year ending 31st December, 1838. During this period there were

17,503	passengers,	I. class, who paid	69,322 francs	65 centimes
215,893	"	II. class, "	702,502 francs	70 centimes
604,935	"	III. class, "	1,033,953 francs	05 centimes
1,343,354	"	IV. class, "	1,087,790 francs	45 centimes.
56,618	soldiers,		45,248 francs	88 centimes.
	For overweight of baggage, and freight,		162,015 francs	67 centimes.
2,238,303	passengers, and total income,		3,100,833 francs	40 centimes.

These numbers explain sufficiently that the railroads in Belgium are used principally by the lower classes of the people.

IV. *Cost of working the Belgian Railroads.*

The accounts kept under this head contain an exact subdivision of the different expenses occurring in working the railroads; the first general subdivision contains *the maintenance of way and police;* the second *the cost of transportation*, viz. fuel, engineers and firemen, repairs of locomotives and cars, grease for the same, also the expenses for conductors, carriers and baggage men; the third embraces *the general expenses*, viz. clerks and ticket sellers, comptrollers, printing, advertising, office expenses, &c. The annexed table contains the expenses under the different heads:

Period.	Maintenance of way & police.	Transportation account.	General expenses.	Total.	
	FRANCS.	FRANCS.	FRANCS.	FRANCS.	DOLLARS.
5th May to 31st Dec. 1835	50,584 01	105,967 88	12,220 84	168.772 73	31,665
Year 1836	132 637 41	261,778 30	36,719 96	431,135 67	80.888
Year 1837	345,824 53	664,940 46	144.706 92	1,155,471 91	216,786
1st Jan. to 31st Oct. 1838,	377,822 58	1,059,180 71	182,186 48	1,619,189 77	303,788
In 3 years and 6 months,	906,868 53 or 27 pr ct	2,091,867 35 or 62 pr ct	375,834 20 or 11 pr ct	3,374.570 08 or 100 pr ct	633,127

As this table contains the expenses of working the railroads 3 1-2 years, these numbers may certainly be regarded as the result of a great experience.

V. *Cost of repairs of Locomotives and Cars.*

In the last table, the sum of 1,059,180 francs, 71 centimes, appears under the head of transportation account for ten months in 1838. This sum contains the expenses for foremen in the shops, 32,177f. 54c.

For laborers, . . . 187,463f. 61c.

At the principal shops in Malines, . 54,868f. 72c.

For materials for repairs, . . 87,965f. 66c.

Total, 362,475f. 53c.

or 68,006 dollars, which is 34 per cent. of the expenses of transportation. I believe that the expenses for repairs of engines and cars, might be diminished by the introduction of locomotives with moveable trucks in front, and of eight wheeled passenger and freight cars.

VI. *Expenses per Passenger per mile.*

The accurate number of miles performed by passengers not being contained in the last report, the expenses per passenger per mile can only be found up to the end of 1837. According to the last statement, the expenses from the 5th of May 1835, to the 31st of December 1837, were:

For maintenance of way, . .	529,045f. 95c.
Transportation account, . . .	1,032,686f. 64c.
General expenses, . . .	193,647f. 72c.
Total,	1,755,380f. 31c.

During the same period, the number of passengers reduced to 1 mile was equal to 45,093,899, which divided in the above, gives as the expenses per passenger per mile,

For maintenance of way,	1.17 centimes,	or 0.22 cents.
Transportation account,	2.29 centimes,	or 0.43 cents.
General expenses,	0.43 centimes,	or 0.08 cents.
Total,	3.89 centimes,	or 0.73 cents.

These expenses are very low, and are exceeded on every other railroad.

VII. *Expenses per mile of travel.*

The number of miles performed by all the locomotives with their trains was:

From 5th May 1835, to 2d May 1836,	14,810 lieues.
From 3d May 1836, to 31st December 1836,	24,825 lieues.
From 1st January 1837, to 31st December 1837,	61,592 lieues.
Total,	101,227 lieues.

at 5,000 métres, or 314,506 English miles; the expenses during the same period of two years and eight months, were

For maintenance of way, per mile of travel,	529,045f. 95c. therefore	1f. 68c. or 31½ cents.
For transportion account, per mile of travel,	1,032,686f. 64c. therefore	3f. 28c. or 61½ cents.
General expenses, per mile of travel,	193,647f. 72c. therefore	0f. 62c. or 12 cents.
Total,	1,755,380f. 31c.	5f. 58c. or 105 cents.

The expenses for every mile which a locomotive with its train runs, amount therefore to 5 francs 58 centimes, or 1 dollar 5 cents, being very near the same as on the American railroads.

VIII. *Number of Passengers per trip.*

In the table under No. 3, we have shown that the number of passengers from the 5th of May 1835, to the 31st of December 1837, reduced for the length of a single mile of road, amount to 45,093,899; during the same period, the trains performed 314,506 miles; this gives 143 as the average number of passengers in a train. This number compared with 5f. 58c. as the expenses per mile of travel, gives again 3.89c. or 0.73 cents as the expense per passenger per mile.

IX. *Comparison between the gross income and the nett revenue.*

The following table contains the annual gross income, current expenses and the surplus of income over the expenses, as is related in the report of the Minister of the 26th of November 1838, to which is annexed the annual surplus for every 100 francs of the gross income.

Period.	Total gross income. FRANCS. C.	Current expenses. FRANCS. C.	Surplus of the revenue over the expenses. FRANCS. CENT.	From 100 f. of the gross income reman'd after defraying all expenses.
5th May to 31st Dec. 1835,	268,997 50	168,772 73	100,224 77	37f. 26 centimes.
Year 1836,	825,132 85	431,135 67	393.997 18	47f. 75 "
Year 1837,	1,416,982 94	1,155,471 91	261,511 03	18f. 46 "
1st Jan. to 31st Dec. 1838	2,633,532 21	1,619,189 77	1,014,342 44	38f. 52 "
Total,	5,144,645 50	3,374,570 08	1,770,075 42	34f. 41 centimes.

As an average therefore, of 3 1-2 years, of every 100 francs revenue, only 34 francs 41 centimes remained, but as all the locomotives and cars are still new, and no amount for general depreciation appears under the expenses, it is to be supposed, that in future only 30 francs will remain from 100. This surplus serves as interest and a sinking fund for the capital.

X. *Gross income per mile of railroad.*

The public in Europe is almost throughout of opinion, that only short lines, and these especially between two populous cities, will pay a good interest, but the branch roads extending to remote, less populated parts of a country will never yield any profits. What results the Belgian roads give in that respect, the annexed table will show:

Period.	No. of sect's. op'n'd	Average length of road in operation.	Gross income during whole period FRANCS. CENT.	Annual income per single mile of read. FRANCS. CT.	DOLLARS
5th May to 31st Dec. 1835,	1	12.6	268,997 50	32,333 75	6,066
Year 1836,	2	22.3	852,132 85	38,212 23	7,169
Year 1837,	6	56.1	1,416,982 94	25,258 16	4,739
1st Jan. to 31st Oct. 1838.	10	118.7	2,633,532 21	26,638 34	4,998
Total		53.1	5,144,645 50	27,735 98	5,204

In the second column appears for the year 1835, only the section between Brussels and Malines of 12.6 miles, opened at that time. In the year 1836, these 12.6 miles were in operation for 365 days, and the second section from Malines to Antwerp, of 14.6 miles, for 243 days only. In multiplying the length of each section by the respective numbers of days, and dividing the sum by 365, we receive 22.3 miles as the average length in operation during the whole year 1836. In the same manner, the average length was obtained for the years 1837 and 1838. The last column shows, that the annual receipt per single mile of road amounted in the first year, when the novelty attracted many passengers, and only 12.6 miles were opened, to 32,333 francs 75 centimes, and that in the 3d and 4th year, when curiosity attracted but few, and the greatest number travelled for business only, and while a much greater length of road was in operation, these receipts amounted still to 26,500 francs per mile yearly. This amount will undoubtedly be increased in the following years, as in 1838 four new sections came in operation, on which the traffic will develope itself only by and by; besides, there will be the transportation of goods, which for the year 1839, is estimated to give a revenue of 850,000 francs for 159 miles, or 5346 francs per mile; the gross income on the Belgian railroads, will therefore also in future, like the first year, amount to about 32,000 francs per mile of road annually. That by the increase of population and com-

merce, also this income of 32,000 francs will be increased, is evident; the railroads in Belgium serve therefore as a proof, that long lines of railroads may (some extraordinary circumstances excepted,) be executed with equal success as short ones.

It would be quite erroneous in calculating the revenue of a system of railroads, canals, or turnpike roads, to regard the income on the principal line separately, and so the revenue of each of the branch lines, in order to judge of the value of each of them. By the opening of a branch line the income of the main line must become greater; because the passengers and freight from the branch lines will pass over the same and increase the revenue. The accurate way of calculating a whole system of railroads, canals, or turpike roads, must therefore be to compare the *total income of the main line as well as of the branch lines*, with the *total length of all the lines*, in order to find the *average income per mile;* and in deducting therefrom the expenses, the balance will show, when compared with the cost of construction per mile, what interest ensues for the capital invested.

XI. *Budget for the operations of the Belgian railroads in the year* 1839.

We have seen that the annual gross income will amount to 32,000 francs per mile, therefore for the 159 miles, which are in operation, to 5,088,000 francs. After defraying all the expenses from 100 francs gross receipts, there remain 34 francs 41 centimes, the nett income will, therefore, be 1,750,780 francs, instead of which the minister in his Budget anticipates the amount at 1,700,000, to which he is led by a different calculation. This surplus is exactly 5 per cent. of the capital expended of 34,000,000 francs. These 5 per cent. suffice for interest and sinking fund, and therefore the Belgian railroads fulfil their object, to maintain themselves without being a charge to the State Treasury.

XII. *Increase of income from the mail and turnpikes.*

As an objection against railroads, it was further maintained, that their introduction in a country will lessen considerably the receipts of tolls on turnpike roads and of the mail, because there will be less travel on turnpike roads, and letters will be carried by persons who travel on railroads; the same opinion appears to have existed in Belgium. On the 27th of January 1838, the Minister, Mr. Nothomb, declared in the Senate, that the revenue of the mail in 1837, exceeded that of 1836 by 262,373 francs, and the tolls on turnpike roads, by 110,000 francs, for the reason that although the tolls on those roads which go in a parallel direction with railroads, are lessened, yet they are increased in a greater proportion on those turnpike roads which lead to the railroads, as they are passed over by all who come to travel on the latter. The revenue from the mail increased in consequence of the greater intercourse occasioned by the introduction of railroads.

XIII. *Comparison of the Belgian railroads with those in the United States.*

According to table under No. 3, the number of passengers during 3 1-2 years, reduced for the length of one mile, amounted on the Belgian railroads, to 88,981,763, or at an average per year of 24,423,361. As the average length of road in operation during the whole time, was 53.1 miles, we have 478,783 through passengers annually. The *Belgian railroads are therefore travelled over on their whole length by nearly* 500,000 *passengers per year.* We have now the following comparison:

[a.] *Cost of construction.*—A mile of railroad with a single track, and

the necessary buildings and outfit, costs in America 20,000 dollars; in Belgium 41,300 dollars, or more than twice the amount.

[*b.*] *Tariff.*—On the American railroads, a passenger pays at an average 5 cents per mile; on the Belgian railroads, only 1 cent or five times less; for freight the charge is, in America, at an average of 7 1-2 cents per ton per mile.

[*c.*] *Speed.*—On the American railroads, passengers are conveyed with a speed of from 12 to 15 miles per hour, stoppages included; on the Belgian roads at the rate of 17 miles, or stoppages not included, at the rate of from 20 to 25 miles.

[*d.*] *Traffic.*—There are at an average, 35,000 through passengers, and 15,000 tons of goods carried annually over the American roads; on the Belgian, there have been carried per year 478,783 through passengers, and the transportation of goods only commenced a short time since.

[*e.*] *Gross income.*—The same amounts on the American railroads, at an average per mile and per year.

From 35,000 passengers at 5 cents,	1,750	Dollars.
From 15,000 tons of goods, at 7 1-2 cents,	1,125	"
From mail and contingencies,	200	"
Total,	3,075	"

On the Belgian railroads, the gross income per mile from 478,783 passengers, and the transportation of freight amounts to 32,000 francs or 6,003 dollars 75 cents per year.

[*f.*] *Expenses per mile of travel.*—These amount on the American railroads to 1 dollar, on the Belgian roads to 1 dollar 5 cents, or they are the same in both countries.

[*g.*] *Number of passengers per trip.*—In Belgium there were in each train, at an average of 3 1-2 years, 143 through passengers; on the American roads, a passenger train contains only 40 through prssengers, at an average.

[*h.*] *Number of trips per year.*—In dividing 35,000 by 40, we obtain 875, as the average number of passenger trips per year, on the American railroads; and in dividing 478,783 by 143, we get 3,348, which represents the average number of passenger trains passing annually over the Belgian roads. As at the same time the speed on the latter is greater than on the American railroad, it was necessary to employ rails of 45 lbs. per yard, while their weight is generally less on the American railroads.

[*i.*] *Expenses per passenger per mile.*—These are in Belgium only 0.73 cents, and in America 2 1-2 cents, or 3 1-2 times more. The reason of it is, that the American trains contain 3 1-2 times less passengers, while the expenses per train per mile are equal in both countries. It is very nearly the same for a locomotive to carry 40 or 143 passengers in a train.

[*k.*] *Annual current expenses.*—In America, the annual current expenses for working a railroad, are per mile,

For transportation of 35,000 passengers, at 2 1-2 cents,	875	dollars.
" 15,000 tons of goods, at 6 1-2 cents,	975	"
" the mail and other expenses,	100	"
Total,	1,950	"

Or 63 dollars 41 cents, of every 100 dollars gross income. On the Belgian railroads, of every 100 dollars gross revenue, the expenses are 65 dollars 59 cents, or per year per mile 3,937 dollars 86 cents.

[*l.*] *Interest on the capital invested.*—In America, the annual average gross income, per mile of road, amounts to 3,075 dollars, the annual cur-

rent expenses to 1,950, leaving 1,125 dollars, which compared with the cost of a mile of road [20,000 dollars,] give 5 1-2 per cent. interest. On the railroads in Belgium, the annual gross income per mile, is 6,003 dollars 75 cents, the expenses 3,937 dollars 86 cents, leaving 2,065 dollars 89 cents as interest on the cost of 41,300 dollars per mile, or exactly 5 per cent.

XIV. *General Remarks.*

The comparison of the results of the Belgian railroads with those of the railroads in the United States of America, speaks evidently in favor of the first. The extremely low charges for passage on the Belgian railroads has increased the number of passengers in an unparalleled degree, and produced an intercourse not attained in any other country of the world. While the higher prices in the better classes of cars yield a considerable profit, the price in the last class or for the great mass of the people, is so low that it almost only covers the expenses. The Belgian railroads are, therefore, throughout a great popular, democratic establishment, which must have found the approbation of the people and every intelligent man; the Belgian railroads afford to the government the greatest facility in the transportation of troops, the importance of which was evinced principally for the last years; the Belgian railroads yield, in conformity with the grand idea of their establishment, only the interest and sinking fund of their capital, but the State treasury has, by the increase of intercourse, indirectly gained in all taxes, in the revenue from tolls on turnpike roads and from the mail; the most important gain, however, was that kept in view by the great founder of these roads, to bring the nation into a more intimate contact, and to form of it one large family, on which the actual national device: "L'Union fait la force," ["Union gives strength,"] becomes realized.

F. A. CHEVALIER DE GERSTNER.

Cincinnati 25th June, 1839.

*** Letters addressed to the care of Messrs. MAITLAND, KENNEDY & Co., New York.

☞ Five francs and 33 centimes, or 533 French centimes, are equal to one dollar. One English mile is equal to 1610 mètres.

RAILWAY FARES.

The *Midland Counties Herald* calls attention to a paper on "Railways in Belgium," which appears in a recent number of the *Journal of the London Statistical Society*, and which contains some statements with reference to fares on railways, that will no doubt be interesting to many of our readers. It should be mentioned that Belgium is the first state in Europe which has established a general system of railways, planned and executed by the government at the public cost. The project was put forth in 1833, the total length of the lines determined upon in the first law passed on the subject, being 239 1-4 English miles, of which 159 1-2 are now completed, and the remaining lines are expected to be opened in the present and the next year. The line from Mechlin to Brussels was opened in 1835, and that from Mechlin to Antwerp in 1836, and the remaining lines were completed in 1837 and 1838. "With reference to the amount of profit which the Belgian government looks forward to receiving from the railways, [observes the writer,] it is necessary to state the view which they take of their position as proprietors. The undertaking might be prosecuted upon three different systems. 1st. As a work of public utility, without requiring that the receipts should cover the expenditure. 2d. As a financial resource, and requiring that the receipts should exceed the expenditure, and yield an

income for public purposes, like the post office in England. 3d. As an establishment which should neither be a burthen nor a source of revenue, and requiring merely that it should cover its own expenses, consisting of the charge for maintenance and repairs, with a further sum for the interest and gradual redemption of the invested capital. The Belgian government adopts the last system, and expects to realise an annual profit of five per ct. upon the original outlay beyond the current expenses. It has, however, been estimated, that the line from Brussels to Antwerp will yield 16 per cent." The following are the remarks on the subject of fares above alluded to:---

"The carriages on the Belgian lines are divided into four classes, the fares of which vary according to the degree of comfort which the conveyances possess. They present a great contrast, as regards amount, with the English fares. The average charge per post league of four thousand mètres, or four thousand three hundred and seventy-four yards, is---

In Berlins, 35 c; equal to 14.08 c., or less than 1 1-2*d* per mile.

In Diligences, 30 c; equal to 12.06 c., or less than 1 1-4*d* per mile.

In Chars-à-banc, 20 c; equal to 8.04 c., or rather more than 3-4*d* pr mile.

In Wagons, 10 c; equal to 4.02 c., or rather less than 1-2*d* per mile.

"There are also wagons for the transport of merchandise, but it is only since the commencement of 1838 that heavy goods have been conveyed by this means. Previous to that period not even the carriages of persons travelling by the railway could accompany them; it was necessary to forward them by the ordinary roads.

(To be continued.)

ALLEGANY MOUNTAINS---THE LOWEST DEPRESSIONS OR SUMMITS FOR RAILROADS FROM SOUTH CAROLINA TO MASSACHUSETTS.

The science of civil engineering, with the competition of the several States, to develope railroad routes from the Atlantic to the valley of the Ohio, has presented some facts in relation to the lowest depressions to pass "the back bone" of the United States, from South Carolina to the north west part of the State of New York, which are interesting to the city of New York and this State.

The South Carolina surveys to connect Charleston by the Butt Mountain Gap with the valley of Ohio and Cincinnati, ascend to 2168 feet above the level of the Atlantic ocean.

The Virginia route, after leaving the mouth of Douglass Creek, on Jackson river, rises 2551 feet, to pass into the valley of the Kanawha river.

The Maryland line from Baltimore, proposes to cross the Cumberland ridge, which is elevated 2754 feet above tide water, by a tunnel of four miles, situated 1898 feet above the ocean.

Pennsylvania has to pass her summit at an elevation of 2326 feet, with ten inclined planes, to reach Pittsburgh; yet with a broken line, of part canals and part railroads, Philadelphia draws off a large portion of the early spring business to the valley of the Ohio and Mississippi, from New York.

The line of the New York and Erie railroad, through the southern tier of counties, passes several spurs of the Allegany mountains, varying in the several ridges from 1400 to 1780 feet above tide waters. The summit on this road is situated in Allegany county, where the waters divide for the ocean by the Susquehanna, and the tributaries to the Ohio and St. Lawrence valleys.

The lowest depression in the Appalachian chain of mountains, from Alabama to Maine, is to be found in the town of North East, county of Dutchess, N. Y., on the east side of the Hudson river. This pass was discovered the laet season, on the line of the railroad from Harlem river to Albany and Troy. The ascent to the summit is only 769 feet above the Atlantic, and is through a remarkable valley, formed by the Bronx, Croton and Oblong rivers, running, with their branches in contrary directions, for near one hundred miles along the east line of the State of New York, into Columbia county. From North East, the line gradually descends to Albany and Troy, with the average rates of 16 feet to the mile, and with no grade in the whole distance to Albany [140 miles from the Harlem river,] that need exceed 30 feet to the mile, with the usual cuttings and embankments. From Troy it is well known that the Erie canal ascen ls gradually to Buffalo, (except for a short distance towards Schenectady,) with an average grade not to exceed eighteen inches in the mile. Lake Erie is situated 565 feet above the tide in the Hudson river—a descending line can be so located, as to defy competition with railroads to the upper lakes from any sea board State.

Massachusetts has turned her attention to the participation in the rich trade to and from the west, which now centres in Albany and Troy. She has advanced the credit of the State to the "Western Railroad" from Worcester to our State line, in the ratio of $6 to $1, to be expended by the company; following the more prudent policy which was recommended in a report of a select committee to both branches of the legislature the last winter, in preference to the purchase of the railroad of the company, or *its construction by the State.* There can be no question but that this road will be in operation from the Hudson to the Long Wharf in Boston, by the close of the ensuing year. Boston will then have accomplished her often declared design, that she will divert at least 280,000 tons of produce, merchandize, and manufactures, with the assistance of Albany and the direct trade on the closing of our canals and river, direct by the western railroad to Boston.

The elevation to be overcome by Massachusetts, at Mount Washington in Berkshire, is 1440 feet, with grades of 80 feet to the mile, to enter the State of New York. With this view of facts, derived from official reports, will the city of New York permit Boston or the north, with Philadelphia and Baltimore on the south, to run away with her early spring business? I trust not. Will she not respond to Buffalo, and not waste her energies (in the first instance,) to induce the State to commence the construction of railroads, when she can secure an uninterrupted line to Boston on the east, Lake Champlain and Ogdensburg on the north, with Buffalo on the west, with a line less in distance than any line from the sea board to the upper lakes, and without comparison, as respects grades, and elevation to pass the Allegany Mountains?

A NEW PATENT.—Mr. Churchill, of Kane county, has invented a machine for harvesting wheat, oats and other small grain, while standing in the field, by threshing and saving the grain without cutting the straw. It has been examined by several farmers and mechanics who have pronounced it an invention of great importance to farming interests. The machinery is simple, and not more expensive than the ordinary threshing machines. It is expected to harvest and thresh at the rate of from one and a half to two acres per hour, with the power of 4 horses. Mr. churchill has taken measures to secure a patent.—*Chicago Dem.*

The arrival within our waters of the long expected Steamer British Queen, has added another bond to the union of the old and new world. We subjoin several items in regard to the size and performance of this fine vessel.

TRANSATLANTIC STEAM SHIPS.

	British Queen. feet.	Liverpool. feet.	Great Western. feet.
Length extent,	275	223	236
" under deck,	245	216	212
" keel,	223	209 05	205
Breadth between paddle boxes,	37 06	30 10	35 4
" outside of bends,	40		
" including "	64	56 3	59 5
Depth midships,	27	19 8	23 2
Tonnage, [builders,]	1863	1149½	1340
Tons of space,	1053	559½	679½
Tonnage of engine room,	963	581	641
Horse power,	500	468	450
Diameter of cylinder,	77½ in.	75	73½
Length stroke,	7 ft.	7	7
Diameter paddle wheels,	31 6	28 5	28 9
Ext. wt. engine boiler and water,	600 tons	450	480
" coals,	800	600	600
" cargo, [measurement,]	600	250	250
Aft water, with the above weight,	16 ft. 6 in.	16 6	16 8

ABSTRACT OF THE LOG OF THE STEAM SHIP BRITISH QUEEN.

July 12.—Sailed from Spithead at 1 P. M.—Wind W. S. W.

13th—Lat. 49 32, lon. 5 45—St. Agnes Light House N E. ½ E. 9 leagues. Distance run, 235 miles.

14th—Wind W N W to S. lat 49 34, lon 11 22—moderate and cloudy. Distance 218.

15th—Wind W N W. lat 49 23, lon 15 50—strong breezes. Distance, 181.

16th—Wind S W by W and W. lat 49 20, lon 21 18—fresh gales and squally—head sea. Distance, 210.

17th—Wind N and N N W. lat 48 6, lon 25 46—strong breezes with head sea. Distance 198.

18th—Wind N by W. lat 46 56, lon 30 10—strong breezes with head sea. Distance, 193.

19th—Wind N by W and N W by W. lat 46 13, lon 34 47, moderate breezes with swell. Distance, 198.

20th—Wind W N W. 45 30, lon 39 1—strong breezes and fresh gales, head sea—ship very easy. Distance, 182.

21st—Wind W N W. lat 45 4, lon 42 1—fresh gales with increasing sea. Distance 130.

22d—Wind W N W. lat 44 43, lon 46 27—moderate breezes. Distance, 190.

23d—Wind W S W. lat 43 42, lon 51 2—light and fresh breezes. Distance, 214.

24th—Wind W by N. lat 43 17, lon 55 40—fresh breezes and squally. Distance, 207.

25th—Wind N W. lat 42 23, lon 60 30—light breezes and cloudy. Distance, 221.

26th—Wind W and W S W. lat 41 14, lon 65 34—moderate breezes and fine. Distance, 240.

27th—Wind N and variable, lat 40 19, lon 70 35—moderate and fine. Distance, 240.

Vessels spoken.—July 14, spoke ship Helen, from the Azores bound to Plymouth in lat 49 32, lon 5 45. 15th, exchanged Nos. with British ship Albion. 19th, boarded the barque Bethel of Bideford, found her abandoned with all sails unbent, all running rigging unrove, all yards across, no boats, laden with railroad iron—water only up to lower deck beams, no provisions or water on board, bulkhead and lockers broken open; appears to have been plundered—and to have been deserted, for what I know not; 11 30, up and set on engines. 23d, passed several vessels at anchor, fishing on the banks. 1 30 P. M. spoke schr. Blender of Providence. 26th, spoke the Ceylon, from Liverpool to New York.

SYRACUSE AND UTICA RAILROAD CELEBRATION.—The Directors of the Syracuse and Utica Railroad Company having invited those who had taken an interest in the construction of their Road to pass over it, and participate with them in a public dinner in honor of its completion, at Syracuse, on Wednesday the 10th inst., a large party of guests from this city, including the members and officers of the Common Council, Messrs. BLOODGOOD and TOWNSEND, former Mayors, Gen. SOLOMON VAN RENSALAER, the veteran Revolutionary officer, Judge BUEL, Lt. MATTHEW GREGORY and Adjt. Gen. KING, Messrs. HAWLEY and BENEDICT, Directors in the U. and S. Railroad Company, left here on Tuesday afternoon in a train handsomely tendered by Messrs. WHITNEY and YOUNG, the agents of the M. and H. and U. and S. Railroads, for their accommodation.

The party having been met at Utica by the President of the Syracuse and Utica Railroad Company, left that place on Wednesday morning, with a large accession of guests, including the fine martial *Citizens' Corps*, of *Utica*, with its excellent Band, and were whirled off to Syracuse, on a Railroad, running mainly through a dense forest and over morasses and swamps which consumed but little more than a year in its construction!

At half-past eight o'clock yesterday morning we were at Syracuse, where a cordial reception from a committee of citizens was tendered. The *Citizens' Corps* wrs received and escorted in the village by a fine company of Artillery.

At two o'clock from four to five hundred sat down to a superb dinner prepared by Mr. RUST, of the Syracuse House, Gen. E. W. LEAVENWORTH, President of the village, presided. As a full account of the celebration is to appear in the Syracuse papers, we will not attempt to anticipate them.

The U. and S. Railroad has been pushed vigorously forward. It has been constructed by the stockholders without either the aid of the State or a resort to loans. The capital is $800,000, of which eighty-seven and a half per cent has been called. It is fifty-three miles in length, and has, as will be seen, been made for twelve and a half per cent less than its capital. It is worthy of remark, that this Road has been completed within the time fixed, and has cost less than the sum estimated. For all this the public and the stockholdrs are indebted to the intelligent, enterprising and efficient services of Messrs. WILKINSON and LEE, the President and Engineer of the Company.

We rejoice to find this link in one of "the three great lines of Railroads"

thus auspiciously supplied. Syracuse, already a large, enterprising, enlightened village, is destined to become a great inland city. It possesses in its soil and its mines, "the potentiality for acquiring wealth beyond the dreams of avarice." These advantages will all be improved by an indomitable yeomanry. Syracuse is now within nine hours (150 miles) of Albany, and within nineteen hours [300 miles] of New-York. The rapidity with which we pass between these two places is amazing. We left Albany at half-past two P. M. on Tuesday, went to Utica in the afternoon, where we remained until five o'clock next morning. Was at Syracuse at half-past eight o'clock yesterday morning; remained until four o'clock P. M. and was at home this morning, breakfasting on a salmon taken from Lake Ontario night before last; having travelled 300 miles, passing a night at Utica, nearly a whole day at Syracuse, and being absent only forty-two hours!

LETTER TO THE SECRETARY OF THE TREASURY, ON THE HISTORY AND CAUSES OF STEAMBOAT EXPLOSIONS, AND THE MEANS OF PREVENTION. BY W. C. REDFIELD.

(Continued from page 342, Vol. VIII.)

The testimony obtained in this case was full and satisfactory. The engineers were both saved, and gave a detailed account of their proceedings previous to the disaster. The principal engineer had himself examined the state of the water in the boilers, a few minutes previous to the explosion, and there appeared to have been great care used on this point, as constituting the only source of danger. He states that the boat was stopped about two minutes at Essex, before the disaster, and he admits that he had more steam on the boilers than it was proper to use in the river, owing to the delays which had attended the progress of the boat. The engineers having full confidence in the supposed strength of the boilers, and knowing that the supply of water was complete, do not appear to have attended closely to the indications of pressure, which was, however, most accurately observed by the two firemen who were then on duty.

The pilot, who appeared a very cautious man, testified, that, after entering the river, he was obliged frequently to order the steam shut off from the engine, because he found it difficult to steer, while under full way. The steam was not blown off at Essex, except as it found its way through the safety-valve; which was loaded nominally to twenty-four pounds to the inch! although here was also a liability to error.

The most satisfactory witnesses were the two firemen, who were both saved, after having been blown into the river. They had seen but little service, but their honesty and integrity appeared altogether unquestionable. From the clear and full details of their testimony, it appeared that the pressure on the boilers at this time must have exceeded twenty-eight inches, [pounds] by the mercurial guages! During the short stop at Essex, they had both tried the water in the several boilers, and found it at the highest try-cock, of which there were four in each boiler. One fireman then crossed to the other boiler, and after renewing the trial of water there, also, they entered into conversation on these circumstances, and on the little need which there appeared for any further firing to maintain a supply of steam. They had never seen the float-roads in the mercurial guages so high as at this time. It was proven by measurement, that at a rise of thirty inches, [thirty pounds pressure,] these rods would strike the upper deck; and they testified that the rods were within three or four inches of the deck when the steamboat arrived at Essex. Other witnesses confirmed these

statements, and that the pressure had not been so great on any previous occasion.

The larboard boiler, which had shown the greatest symptoms of straining, and received most of the previous repairs, exploded a little before the other, but the second instantly followed it; owing, probably, to the tremendous shock communicated through the steam-pipes, and by which they were broken asunder; while the boilers, being alike in their structure, were both charged to the limit of their strength.

In summing the results of their examination, the board reviewed the principal conjectures or hypotheses which had been urged by manufacturers and others, in order to account for this disaster, and pointed out their inapplicability to the case before them. They then came unanimously to the conclusion, *that the explosion was caused by an excess of steam, produced in the ordinary manner.*

In this age, distinguished for experimental knowledge and exact science, it might have been expected that the facts of the above case would have been patiently sought, and considered with attention, especially by professed teachers in physical science, and by those who are directly interested or employed in steam navigation. But notwithstanding our boasted attachment to the inductive philosophy, we find too often, that opinions and hypotheses on questions of pure physics, are cherished and defended with a pertinacity which is proportioned to their incertitude and lack of evidence; for in these cases the imagination has fuller scope for the defence of its own creations. In view of the facts which have passed under our notice, it is matter for regret that engineers of long practice, as well as some men of authority in science, should have lent their aid, without due inquiry, in support of prevalent errors.

Remedies for explosions, in order to be effectual, must be derived from a correct knowledge of the facts which serve to indicate their proximate causes. It appears remarkable, therefore, that this inquiry, instituted by the owners of the New England, should be almost the only attempt at careful and thorough investigation, for the benefit of the profession and of the public, which has yet been made in our country.

It was not reasonable to expect that the report of the above examination, although supported by the clearest evidence, would convince those who had long cherished some favorite theory concerning explosions; but the comparative safety which has since attended the numerous and rapidly increasing steamboats in this section of country, may induce the inference that a real advance has been made in exploring the cause of the evil and providing its proper remedy. As within the last few years explosions are almost unknown in the New-York waters, may it not be inferred, also, that the most effectual remedy within the power of Congress, is to provide for a thorough and free investigation of all such accidents and their causes, by persons competent to this duty, without reference to judicial measures; and for the proper publication of the facts, evidence, and conclusions which may be arrived at in each case. This could not fail to afford us light on this important subject, such as would be available both to professional men and the public at large. We should then no longer grope in darkness, and our future experience would determine the question, whether persons who happen to be engaged in steam navigation are actually possessed by a species of monomania or indiscretion, which induces them wontonly to sacrifice their own lives and property, and those also of their nearest friends and fellow-citizens.

If we may rely upon the indications afforded in the above cases by the state of the metal in the exploded boilers—the most conclusive, perhaps, of

all evidence—it will appear that the most common cause of these accidents in this quarter, at least, has been the general use of boilers of insufficient strength, which have been worked under a pressure which has proved beyond the power of the boiler *permanently* to sustain. The *tenacity* of the boiler-metal is in a great measure unavailing in resisting the external pressure to which the interior portions of the boiler are subjected; and reliance must here be had chiefly upon its rigidity, which is increased in a high ratio to the reduction of the diameters. The iron boilers which have been constructed on the general plan of those of the New-England, at later periods, are more strongly braced, and in addition to the advantages of a more rigid metal, have four arches instead of two, which greatly increases their security; although a further advance in the strength of these structures is still desirable, especially in the part called the steam-chimney.

There is some reason to believe that the prejudice in favor of copper, as a material for boilers, was not eradicated from our southern cities by the experience had on the New-York waters; and that the ill-fated Pulaski, which was lost in 1838, by the explosion of her boiler at sea, was projected under this disastrous influence. That it was the design of her owners to attain the greatest degree of security, cannot well be doubted; but the accounts which I have received of the methods adopted in the construction and security of her boilers, afford grounds to infer that her actual strength was but little if at all superior to those of the New-England; and I am also informed that they had, on some occasions, been worked with a pressure of thirty-six inches, and it is confidently stated that the gauge was seen at twenty-eight inches on the night of the explosion—a practice which, if truly reported, must have arisen from the general confidence of all concerned in the adequate strength of the boilers. But the deplorable event has proved that this confidence in the supposed superiority and strength of these copper boilers had no just foundation; and the only matter for surprise, in view of such a state of facts, is, that an explosion did not sooner occur. Had the boilers been of iron, and of the same construction, it is probable that a regular working pressure could not have been obtained of sufficient intensity to have been immediately dangerous, for nearly double the amount of pressure would have then been required to produce the disruption.

Shipwreck of the Home.

This subject demands our present notice only on account of the influence it may be supposed to have had upon the recent legislation of Congress in imposing a system of inspection and fees upon the hulls of steamboats. Those who are fully conversant with all the facts of the case, need not to be told of the absurdity of the current statements regarding the loss of this ill-fated vessel, though countenanced by the *ex parte* inquiry and report of a popular committee composed of clergymen and others, not professionally conversant with the matter before them, and gotten up under the greatest possible extreme of misapprehension, excitement and error.

It may not be generally known that this vessel was constructed by some of our most able shipwrights, in a manner not visibly inferior to our best packet ships, so far as may be inferred from casual inspections while building. That there were special faults in this vessel, I believe; the chief of which, I conceive to be a want of greater depth of hold, which her length seemed to require. But the chief cause why she was strained more than the other steamers which have navigated our coast, was probably owing to her *greater weight*; being, if I mistake not, heavier built than most of her competitors. From the evidence before us, I feel bound to consider the *catastrophe* of the Home as occasioned by her being volunta-

rily run on shore in the breakers, chiefly through the influence of the alarmed passengers. who were apprehensive of foundering. Immediately previous to this act, the vessel, though partially water-logged, was under the land and the gale was abating; and had she then been brought to anchor, as was the South Carolina, in similar circumstances, on the same night, it is probable that she would not have sunk, and that no lives would have been lost. But, however this might have been, this case of shipwreck, and the subsequent catastrophe of the Pulaski, seemed to have had an extraordinary influence in procuring the adoption of the scheme of legislative remedies.

It may be justly questioned, however, whether the exisiting system of naval construction as practised in this and other countries, be not radically defective. In all the heavy shocks and strains to which a sea-vessel, and especially a sea-going steamer, is necessarily exposed, the ultimate strength of the whole structure consists only in the lateral resistance which is afforded by the fastenings and their bearing surfaces. Now it is both obvious and demonstrable, that this resistance is equal to only a very small portion of the strength of the timber and materials employed in construction, and is quite unsuited to the intensely severe strains to which these floating structures are sometimes exposed.

The remedy which suggests itself consists *in the mutual interlocking of all portions of the structure which lie in contact with each other.* In adopting this method, we relieve the fastenings from the great lateral strains by which they are injured and loosened in their bearings; and the resistance is transferred to the general mass of woody material which is employed in construction, where it is productive of no injury, the fastenings being thus relieved from all other duty than holding the parts in their proper places. The superiority of this method of construction, as compared with the pegging system, ordinarily practised, and in which reliance is only had upon the lateral resistance of the wooden and metalic fastenings, is too obvious to require elucidation. A freighting vessel of 350 tons, on the Hudson, in the construction of which I have put this interlocking system in practice, is believed to exceed, in comparative strength and promise of durability, any other vessel now afloat. I consider this system of construction to be of essential importance, especially in a steamer which is to encounter the boisterous waves of the Atlantic.

Theories of Explosion.

The theories or hypotheses by which explosions are commonly accounted for, usually without proper examination, and on the most vague and uncertain evidence, are chiefly the following:

1st. Injury to the boiler from heat, owing to a supposed deficiency of water.

2d. A sudden generation of steam by the affusion of water upon portions of a boiler thus heated.

3d. The supposed generation of violently explosive gases which are let off in the boiler.

4th. Recklessness on the part of those in charge.

5th. Ignorance of their proper duties in the same persons.

6th. Intoxication.

To which should probably be added as more influential than all these,

7th. Insufficient strength in the boiler for the duties permanently required of it: owing to which cause the defects of the material, insidious fractures, or deficiency in water, have become destructive; either with common or an extra degree of pressure.

It is probable, that the two first of these alleged causes have contributed to the explosion of high-pressure boilers; and the deficiency of water is always to be considered as a source of danger and of certain injury to the boiler. Moreover, the greatest care on this, and other points connected with the management of boilers, cannot be too strongly inculcated upon those in charge. But it is well known that iron boilers have, in *many cases*, been injured by a deficiency of water, under the very circumstances which are alleged as producing the most violent explosions, and that no other ill consequence has ensued than the injury to the metal. In the absence of all direct evidence, therefore, it is neither wise nor prudent, to throw the odium or responsibility of these accidents, which it is probable have mainly resulted from the general faults of the system, upon those persons who have too often perished while performing their executive duties according to their best knowledge and skill.

The theory which supposes the rapid generation of some yet undetected and highly explosive compound, is not worthy of consideration, having no other known support than may be found in a speculative fancy.

Ignorance of incumbent duties and recklessness of conduct, though sometimes found among all classes, are qualities which are not likely to obtain preference from the owners of steamboats, whose fortunes or success in business are mainly dependent upon the correct and intelligent performance of duty on the part of their agents and subordinates. In callings which are open to all classes, the only complete remedy for ignorance must be found in a more general and thorough system of popular education.

Persons who are in the habit of resorting to drugs or stimulants to keep up their vital energies, or for the gratification of a morbid appetite, are unfitted, generally, for so responsible a service as that of our steam vessels, and should never be employed, except in cases of sheer necessity. But in this species of misconduct, as in other cases, the securities afforded in construction, should be such as to prevent the consequences of this vice from becoming fatal.

The notion that boilers, under the pressure of steam generated in the ordinary way, never burst, but only rend, has no foundation in truth, and has been sufficiently refuted on various occasions.

Steamboat Racing.

This subject appears to have attained an importance in public estimation to which it has no just claims. That there have been instances of misconduct attending these competitions, I have myself witnessed; and such instances are, doubtless, somewhat common. But that they are usually instrumental in putting in jeopardy the lives of passengers, is chiefly a bugbear of the imagination, which has been fostered by the public press till it passes on all occasions for reality. It does not appear to be generally understood, that the boilers of steamboats, if properly constructed, and particularly of those boats which carry large engines and work their steam expansively, are utterly incapable of generating a sufficient supply of steam to endanger the safety of the boiler while the engine is employed. The whole combination of parts in a properly constructed steam vessel is such as to allow, if not require, all the heat which can be applied to the boiler, with no other check than is afforded by considerations of economy; and the engine is competent to receive and work, with entire impunity to the boiler, all the steam which can by any means be thus generated. The entire structure is expressly designed for the attainment of the greatest possible degree of speed; and while this is aimed at, under the general

restriction before mentioned, the parties in charge are only laboring in their proper vocation; provided always, that their conduct in other respects is judicious and proper, and that the vessel be navigating in smooth water of sufficient depth.

Of the various disasters of our steam navigation, I can recollect but a single case in which the explosion of a boiler could reasonably be referred to racing, and even in this case, it is probable that the disaster only occurred a few days or weeks *sooner* than it might otherwise have done.* I would by no means become the apologist of misconduct in this or any other matter; but it is time that the indiscriminate and sickly outcry which is so often raised on this subject, should cease; for it is obvious that it can answer no other purpose than to increase the discomfort and terrors of weak and uninformed persons, or to furnish the occasion for a proscriptive paragraph in a public journal. The public have a real interest in the personal comfort and rapidity of steam navigation, which ought not to be trifled with in a senseless manner. These remarks are particularly applicable to the state of steam navigation in this quarter of the Union.

Every calling and pursuit in life is a race. The politician, the jurist, the artisan, and the mariner, all justly aim to accomplish the greatest ends in the shortest period. Why are not the enterprising commanders of our packet ships arraigned before the bar of the public, or subjected to penal enactments by Congress, for the unprecedented zeal and success with which, in late years, they have driven their ships through the waves of the Atlantic, in the face of dangers and of storms? Plainly, because those who have but little knowledge of seamanship do not attempt to control its operations.

Comparative Hazard of Steam in Navigation.

So alarming have been the accidents in steam navigation on our western rivers and elsewhere, as to induce a belief in the minds of some, that of all modes of conveyance this is the most hazardous. That a degree of danger has attended this mode of travelling which ought to be lessoned or avoided, it were vain to deny; but when we reflect on the recent origin of the art, and the vast numbers of persons who are transported by its means, and when we also consider the exposure and comparative accidents of other modes of navigation and means of conveyance, this impression will be materially altered, and we shall rather have cause to wonder, that under all the circumstances of the case, so small a fraction of the travelling public have become victims to this hazard. We have, indeed, a fearful list of steamboat explosions; but the sufferings and fatalities which have attended other modes of transport and conveyance, pass off with but little notice, as common occurrences, and their statistics are seldom known. Consequently, the public mind does not become excited in contemplating these casualties, which are treated only as evils which are incident to the common lot of man

By the report of a select committee of Parliament in 1836,† it appeared that the number of English vessels lost, in a period of three years, (1816,–'18,) as collected from the books at Lloyd's was 1,203; and in a subsequent period of like duration, [1833–'35,] was 1,702. That the number of persons distinctly known to have been drowned by these vessels in the first named period, was 1,700, and in the second period, 1,714.

That during a period of 16 months, ending May 1, 1834, the loss of property by vessels reported in Lloyd's books as missing or lost, was es-

* I refer to a case on the river Ohio. † See London Nautical Magazine.

timated at 760,000 pounds sterling; and the loss of lives in the same vessels was estimated at 1,425. *These returns embrace only the losses entered at Lloyd's*, and by no means embrace the whole losses of British shipping.

It appears, also, that the *whole* loss of property in British vessels by shipwreck or foundering, is estimated at £3,000,000 sterling, annually; and the annual loss of life at sea at not less than 1,000 persons, not including the numerous losses of life on their own coast.

As regards our own navigation, which is inferior only to that of England, we find the following notice:

"*Shipwrecks in the year* 1837.—"During the year past, there has been published in the Sailor's Magazine, a monthly list of shipwrecks which have occurred, principally of American vessels, and which have been published from time to time in various newspapers. Those only have been selected which resulted in a total loss of the vessel. The number of vessels thus reported during the year, is as follows: ninety-four ships and barques, one hundred and thirty-five brigs, two hundred and thirty-four schooners, twelve sloops, and fifteen steamboats; making a total of four hundred and ninety-three vessels, which have been wrecked. Of these, forty-three were lost toward the close of the previous year, though the account was not published till the commencement of this; thirty-eight were lost in the month of January, fifty-four in February, twenty-four in March, thirty in April, nineteen in May, fifteen in June, forty-two in July, fifty in August, thirty-two in September, forty-three in October, forty-three in November, and six in December. The precise time when the remaining vessels were lost could not be satisfactorily ascertained.

"In the above named vessels, one thousand two hundred and ninety-five lives are reported as being lost. This, probably, is but a part of the whole, for, in many instances, the crew are spoken of as missing, and in other cases nothing is said, where, perhaps, there was a total loss."—[*Sailor's Magazine.*]

This statement is said to comprise no deaths by steamboats, except in cases where the vessel was totally lost. On the other hand, a very large proportion of the fatal accidents in ordinary navigation, must have escaped the knowledge of the inquirer.

Now, in view of this immense waste of life, let it be well considered, that in the art and practice of navigation other than by steam, the world has had the experience of more than four thousand years, and the efforts and intellect of many generations have been tasked for its greater security; while, on the other hand, *a quarter of a century has scarcely elapsed* since the powers of steam became prominently known in navigation, and we have as yet only witnessed the brief *infancy* of its application to this important purpose. Surely, then, it is not surprising that disastrous and fatal accidents should sometimes have attended its use. There is cause for astonishment, rather, that so great a degree of average security should have been attained, in so brief a period.

Each great district of our widely extended country possesses its own peculiar facilities and hazards in this species of navigation, and exhibits, also, different stages of improvement and security in the use of steam. In this quarter, the average degree of security enjoyed by passengers in our steamboats is certainly greater than is possessed by persons who walk the streets of our large cities. During the last five years, *millions* of passengers have been carried on the steamboats which run from this city, and, among all these, the catalogue of deaths by steam explosions is almost inappreciable.

It is probably true, that in hardly any other circumstances in which such

numbers have been placed, has the occurrence of mortality been so entirely wanting. It is with a strong sense of injustice, therefore, that those who are engaged in this important and not always profitable avocation, have found themselves selected as the objects of special and seemingly invidious legislation.

We know that elsewhere the result has been different; and much undoubtedly remains to be accomplished, in perfecting this important art, so as to render it, both here and in all other portions of our country, as secure to the traveller as can be reasonably desired. But this is plainly a practical desideratum, which can only be attained by the continued exercise of the experience and professional skill of those who may be engaged in this important department of enterprise.

Supposed Safety of English Steam Vessels.

Of the various errors and opinions which have been cherished in our country, through prejudice or want of information, there is none, perhaps, which threatens to be more immediately injurious to our commercial interests, than that which ascribes to English steam vessels an almost entire exemption from explosions and shipwreck. This error would have remained unnoticed by me, had it not appeared as one of those general impressions which have contributed to the recent legislation on steamboats. It does not appear to be generally known that the principles of construction, the arrangements for security, and the general combination of parts in the English engines of the present day, do not differ in any essential degree from those which were usually adopted in this quarter previous to the year 1825; and that accidents of a serious and fatal character have not unfrequently attended the use of steam in Great Britain, both on land and in navigation.

It is a fact, also, which may not be generally known, that there has been a greater loss of life by the explosion of steamboat boilers, during the present year, [1838,] on the river Thames alone, than has occurred in the numerous and crowded steamboats which have run to and from our principal commercial city during the last five years!* And notwithstanding the contrary impressions made on the public mind by the shipwreck of the Home, and the recent appearance of several of the largest and best English steam vessels in our waters, it is also true that fatal accidents and shipwrecks have not unfrequently attended the English steam vessels. As the steam accidents in England have excited but little attention in our country, I now add such accounts and notices of accidents or extraordinary hazards to English boilers and steam vessels, as happen at this time to be in my possession. The immediate causes which are assigned in order to account for these accidents without impugning the general system of construction practised in England, may be allowed to pass for what they are worth.

Notices of accidents and extraordinary hazards to English boilers and steam vessels.

1. *Loss of the Red Rover.*---In October, 1836, a correspondent of the Nautical Magazine notices "the lamentable accident of that fine steamer, the Red Rover," which appears to have sunk, in consequence of a collision with the steamer Magnet, near the Nore.---*Nautical Magazine, December* 1836.

2. *Explosion of the Union Steamboat.*---Hull, June 7, 1837. This morning at 6 o'clock, at the moment when the Union steamboat, from

* allude here to two successive explosions on board the steamer Victoria, which are mentioned in the subjoined lists, and by which more than a dozen persons lost their lives.

hence, was about to sail for Gainesborough, owing to some neglect the boiler burst; and the packet being loaded on deck with passengers, (about 120,) the mischief done and loss of life have been dreadful. Several bodies were carried over the pier into the Humber; a fishing smack picked up one body, and saw two floating down at a short distance, apparently bodies of females. One person was carried into the air the height of some sixty feet, and came down on the roof of Mr. Werterdale's mast manufactory, which is seventy to eighty yards from the place where the packet lay, and is a building forty feet high. The safety valve was blown against the office of the York packet, [a wooden shed,] about one hundred yards from the spot, with such force as to destroy one side of it.---*Nautical Magazine, July*, 1837, *p.* 474.

It was in evidence in this case, that the water ran freely from the second gauge tap, immediately previous to the explosion; that the proper weight was on the safety valve, which was lifted a moment before, and found in perfect order; and that the boiler would bear ten pounds to the square inch, but was adjusted to work with 5 1-4 or 5 1-2 pounds. The boiler had been in use less than six months. The explosion of another boat, called the *Graham*, is also alluded to in the evidence.

3. *Foundering of the Apollo steam vessel.*---About 4 o'clock in the morning of the 5th September, [1837,] the steam ship Monarch, Bain, for Leith, and the steam packet Apollo, Minter, from Yarmouth, for London, came in contact off Grays, [Essex;] the Apollo went down in ten minutes afterwards, and the stewardess and two children were drowned.---*Shipping Gazette,*

4. *Loss of the Killarney steamer.*---This steam vessel was wrecked by stress of weather on the 20th of January, 1838, on the coast of Ireland, on her passage from Cork to Bristol; and of 37 persons on board, 24 perished.---*See Nautical Magazine, March* 1838, pp. 211 and 212.

5. *Fire on board the Ocean steam ship.*---Yesterday [Sunday] afternoon, between one and two o'clock, very great excitement was created on the river, and also ashore, amongst the ship owners, by a fire being discovered raging on board the new and large steam ship, the Ocean, Myddleton, of London, lying off the custom house quay. The Ocean had just arrived from Calais, with a most valuable and extensive cargo, consisting of merchandise and goods of all descriptions; there were a great many passengers on board, and they were landed at London bridge wharf before the vessel was moored with other steamers of the foreign station, off the custom house. The flames were first seen raging amongst the larboard coal-bunkers, close to the furnaces, and by that period they must have been burning a considerable time. The engineers and firemen made every attempt to extinguish the fire, but ultimately, by the overpowering influence of the smoke, they were forced upon deck. The greatest fears were now entertained for the safety of the vessel, as the fire had extended abaft the boilers, and comnunicated to the linings. Volumes of smoke were seen to issue from the engine room and round the funnel, which rapidly increased, and the utmost confusion prevailed amongst those on board, and the vessels lying alongside. When an entrance into the engine room could not be obtained, the deck, save that portion on fire, was torn up by pole axes, and thereby access was found to the flames; the force pumps were then got to work, and in about an hour the fire was completely subdued, to the gratification of those on board, and before so much damage was done as was at first, from the appearance of the flames, anticipated. There is no doubt, had the disaster taken place at midnight, the consequences would have presented a different appearance altogether. It is believed that it must have been from

the excessive heat of the furnace, and not through the coals in the bunkers. The engines of the Ocean are of an extraordinary power, and the vessel is the property of the General Steam Navigation Company.—*English Paper, Sept.*, 1838.

6. *Disruption of the boiler of the William Stanley steamer.*----Liverpool, August 21, 1838.----Yesterday morning, about eleven o'clock, great consternation was caused at George's pier-head, by the supposed bursting of a boiler of the William Stanley, Eastham steamer, whilst lying alongside of the pier. But the truth appears to be, that the lower plate of the boiler gave way, previous to their firing up to leave the pier; and no accident was occasioned, except the scalding of the legs of a lad who was employed on board [!]----*English Paper.*

7. *Hazard of the Tweedside steamer.*----North Shields, September 15, 1838.----Intelligence reached here to-day of a very narrow escape from a melancholy disaster on board of the Tweedside steamer, on her passage from Leith to this place. She left Leith early yesterday morning, and proceeded on until she came near to North Berwick, when it was discovered that the steamer was on fire. Attempts were made for some time to extinguish the flames, but without effect. The alarm of the passengers was dreadful; when, fortunately, a London steamer came in sight, and various flags of distress were hoisted. The passengers were taken on board of the latter vessel, and conveyed to Leith, where they were placed on board of the Northern yacht, and arrived here to-day. The Tweedside was towed into Berwick, where she will receive the needful repairs. The passengers arrived here, concur in stating that, but for the providential appearance of the London steamer, all on board would have perished.----*Shipping Gazette.*

8. *Fatal steam boiler explosion.*----Another steam explosion, attended with loss of life, occurred at Halliwell, near Bolton, in this county, on Wednesday se'nnight, at the factory of Mr. W. G. Taylor, Hill mill; and we regret to say that the consequence proved fatal to a young man named Thomas Halliwell, aged nearly nineteen, an engine tender. The deceased had been four years assistant in the engine house, and was a steady, industrious workman. The boiler burst with a loud crash, destroying the engine house in a moment, and burying the deceased amid the ruins. All hands were soon on the spot, and, after removing the bricks and the stones, the body of the unfortunate man was found quite lifeless; he was dreadfully scalded and disfigured, and presented a miserable aspect. Mr. Taylor's mill being furnished with an excellent water-wheel, steam power, we understand is only used there occasionally. The boiler was in admirable condition, and the accident can be attributed to no other cause but an excess of steam, or a deficiency of water. An inquest was held the following day at the Lamb Inn, Sharples, before W. S. Rutter, Esq., coroner. The jury were of opinion that the accident had been occasioned by overfiring, in consequence of the steam being low. The death of the deceased was quite accidental, and no blame could be attached to any party.----*English Paper, September*, 1838.

9. *Dreadful steam boiler explosion.*----Newton-in-the-Willows, Monday night, September, 1838.----The viaduct foundry on the Manchester and Liverpool line of railway at this place, the property of Messrs. Jones, Turner and Evans, was this morning the scene of a dreadful and fatal steam boiler explosion. Six persons are already dead, and four others are lying without the least hope of recovery. It appears that Messrs. Jones & Co. employ about 200 men, and in the course of their business use two steam engines, one of 16 horse power, and the other of 8, to drive the blast for the smith's

furnaces. Last week a new boiler was put to the 8 horse engine, and the foreman of the yard, Joseph Dangerfield, who superintended the erection of the boiler, resolved upon setting it in motion himself. It was tried on Saturday, and was then found to work well. This morning he was called by the watchman at five o'clock, and he immediately proceeded to light the fire and get the steam up in the boiler. He accomplished this task by six o'clock; at that hour the men came to work, and about ten or a dozen of them stood at the mouth of the furnace, anxiously waiting to witness the evolutions of the engines, which had been stopped for the purpose of attaching the straps communicating with the machinery of the foundry. This had been in part accomplished, when all of a sudden the steam and water burst through the flue of the boiler, and carried the contents of the furnace and part of the brickwork full 40 yards from the building. The explosion was terrific. The bystanders and Dangerfield were carried as if by a gun shot into a field of corn on the outside of the foundry palings. The palings were knocked down, and the corn levelled to the ground for full 20 yards distance. Three of the men were picked up quite dead; their names are Joseph Dangerfield, Samuel Appleton, and George Fazakerley. John Dean was found on his knees praying to the Lord to have mercy on his soul; he lived until 10 o'clock. Thomas Price was picked up insensible; John Parker was dreadfully mutilated; William Wells, George Hough, William Dane, and —— Wilson, were also taken up dreadfully scalded and bruised. They were quickly attended by some surgeons and a physician from Newton and St. Helans. George Hough and William Wells lived for a few hours only. Most of the sufferers are married men, with large families.

A seventh sufferer died just as our informant was closing his report. His name is Price, the father of a large family.

No cause is assigned for the accident. The exterior of the boiler still remains perfect.—*English Paper.*

10. *Extreme hazard of the Royal Tar steamer.*—We reported in the *Shipping and Mercantile Gazette* of Saturday, that the Royal Tar [steamer] had put back to Falmouth; the following particulars we take from the *Courier*:—It appears that the Royal Tar underwent some trifling repairs last voyage at Limehouse, and left the river on Friday the 12th inst, for Lisbon and Gibraltar. On reaching the Bay of Biscay she met a heavy sea and stiffiish breeze, which strained her to that degree that she was half full of water before the captain and crew were aware of it. If there had not been six pumps to go to work, she must have gone down. There were 65 passengers on board; and when it was reported that the ship was sinking, the scene of dismay and uproar that ensued, baffles description. A passenger writes as follows: "The company have got an exceedingly clever officer in Mr. Lewis, the commander of the Royal Tar; and to his presence of mind, in the first instance, and his determined conduct afterwards, do we owe our lives, and the company the safety of the vessel." The passengers have landed at Falmouth, there to await the arrival of another steamer.*

11. *Great hazard of the Victoria steamer.*—Liverpool, October 20, 1838.—On Friday last, after beating out through Crosby channel the crew of the pilot boat No. 9, saw a steam vessel, with a signal of distress up, the ensign union down, and a whiff up forward at the fore-topmast head, appearing in great distress, and in want of the assistance of the pilot boat.

* This disaster, resulting from the straining of the vessel, resembles that of the Home previous to her being run on shore, except that the severity of the weather, appears to have been far greater in the case of the Home.

At this time [half-past twelve,] the vessel was a long way to the leeward of the pilot boat. The latter made all possible sail towards her, perceiving that she was drifting down on West Hoyle bank. At two o'clock they got to her, when she proved to be the Victoria, from Liverpool for Strangford; the captain hailing the master of the pilot boat, saying that he had lost his rudder, that his pumps were choked, that all his passengers and crew were bailing with buckets to keep the vessel free, and that the water was gaining so fast as to put the engine fires out. The master of the pilot boat promptly rendered assistance, by getting two ropes from his stern, and endeavoring to steer him into safety. With difficulty, the pilot boat got hawsers from each quarter; but the sea running very heavy, with squalls, it parted both hawsers. The master advised the captain of the steamer, under this difficulty, as she had no way through the water, and was quite unmanageable, and through the indefatigable exertions of himself and crew, an endavor was made to replace the hawser, when a heavy sea struck the steamer, and hove her on board of the pilot boat, which sustained considerable damage. From thirty to forty passengers jumped on board of the pilot boat at the same moment, which placed the master and crew in an awkward situation. The master advised the captain to allow No. 10 pilot boat, which was in company, to have a hawser out from forward to tow ahead, as the night was coming on very fast. With great difficulty this was accomplished. The pilot boat had not towed more than half an hour when a very heavy squall came on, and parted the best and newest hawser which the steam vessel had on board, and the same squall parted also one of the hawsers which No. 9 had out astern steering her; so that there was only one hawser left to steer her by—the only one on board the steamer. Fortunately it held until they got into smooth water; and at 7 P. M. they came to anchor in safety near the N. E. buoy. At the request of captain Aberdeen, the pilot boat No. 9 came to anchor close astern of the vessel, where she remained until Saturday morning, when the steamer was towed in safety to the entrance of Clarence dock. Great praise is due to the masters and crews of the pilot boats for their exertions on this occasion. Had it not been for their interference, the Victoria would have been inevitably lost. No. 9 pilot boat sustained very considerable damage, and has been since undergoing repair.—*Liverpool Mail.*

12. *Upsetting of the Shamrock steamer.*—Waterford, Oct. 20. 1838.—Thursday, as the Shamrock (steamer) was coming down the Ross River, the pigs on board went all to one side, and the steamer filled. The passengers landed safely, and the disabled vessel was towed up to Waterford by the Duncannon.—*Waterford Mirror.*

(To be continued.)

SPECIFICATION OF A PATENT FOR CAST IRON WHEELS TO BE USED ON RAILROADS; GRANTED TO SAMUEL TRUSCOTT, GEORGE WOLF, AND JAMES DOUGHERTY, COLUMBIA, LANCASTER COUNTY, PENNSYLVANIA, MARCH 17, 1838.

To all whom it may concern, be it known, that we, Samuel Truscott, George Wolf, and James Dougherty, of the Borough of Columbia, in the county of Lancaster, and State of Pennsylvania, have invented a new and improved mode of constructing cast iron wheels for railroad cars, and for other purposes; and we do hereby declare that the following is a full and exact description thereof.

We denominate our wheel, the *Double Plate Car Wheel*, because we use two plates, instead of the spokes, or arms, usually employed, which plates are cast with the rim, and form one substance therewith. We give

to the rim of our wheels the same form in all respects as is now given to the rims of car wheels, but instead of arms we cast our wheels with two parallel, or nearly parallel, plates, which plates are convex on one side, and concave on the other; the hub, or nave, which is to receive the axle, is cast in the centre of these plates, extending from one of them to the other. The accompanying drawing gives a sectional view of one of our wheels, *a*, *a*, being the rim, *b*, *b*, the front and back plates, convex on one side, and concave on the other; *c*, *c*, being the hollow, or void space between them; and *d*, *d*, the nave, or hub. The hollow *c*, *c*, between the two plates is formed by a core, in the process of casting, which core is supported in the flask by leaving suitable holes in the plates for that purpose, which serve also for the removal of the sand of which the core is formed.

We cast our rim in a chill, in the usual manner, and in consequence of the particular form given to the plates, they contract in cooling without danger of fracture, and without its being necessary to divide the hub, as is done when car wheels are cast with spokes, or arms. The only effect of contraction is to flatten the two plates in a slight degree, operating in this respect like the curved arms of many cast iron wheels.

We are aware that car wheels have been made with plates as a substitute for arms, but such plates have been made separate from the wheels, and united together by screw bolts, embracing the hub in a distinct piece between them. The difference between such wheels, and those constructed by us, is so obvious as not to need pointing out.

What we claim as our invention, and wish to secure by letters patent, is the manner of constructing wheels for railroad cars, or for other purposes to which they may be applied, with double convex plates, one convex outwards, and the other inwards, and an undivided hub; the whole cast in one piece, as herein fully set forth.

SAMUEL TRUSCOTT,
GEORGE WOLF,
JAMES DOUGHERTY.

[*Journal of the Franklin Institute.*]

MORE "RAILWAY MISERIES."—A new disease appears to have broken out amongst railway travellers, in consequence of the velocity of speed. A gentleman of great experience in the old way of travelling, who resides not twenty miles from High-lane observed to us the other day, that this disease will in time completely upset the intellects of such of her majesty's subjects as are so unfortunate as to adopt this expeditious way of "whirling their bodies" from one end of the kingdom to the other. The worthy gentleman above alluded to offered to make a considerable wager, that he would take his stand in Market street, Manchester, and could instantly find out from the passengers in that thoroughfare, all such of them as had just left the railway, and were proceeding to business. He describes them as being so full of speed and motion, that though they are mounted on their own pedestals in the streets, yet they fancy they are still on the railway, and like the merchant of Rotterdam, with his cork leg, unable to control their speed. He asserts that he actually saw one gentleman so full of velocity, that in attempting to turn the corner of the Royal hotel, to get into Moseley street, he ran his head against one of the gas lamp posts, and broke the iron pillar to shivers. Most men would have thought that the head would have broke, but such was not the fact, as could be abundantly proved by many persons on the spot. The anti-railroad gentleman further stated, as a fact notorious, that many persons had confessed to him, that they had

frequently gone to Liverpool and London on the railway, and from the extreme velocity of travelling had forgot what they went for, and had actually to write to their Manchester friends to be informed what they went to town for. The subject appears to demand the serious attention of "philosophy," and all professors of the infancy, and preserve to our fellow countrymen what little sanity they may have left since the passing of the reform Bill. Her majesty's ministers are infected by the rapid railroad method of legislation, as may be satisfactorily proved by the sagacity and integrity of their proceedings.—[*Stockport Advertiser.*]

SPECIFICATION OF A PATENT FOR AN IMPROVEMENT IN THE MODE OF MAKING CAST IRON WHEELS ROR CARS, TO BE USED ON RAILROADS. GRANTED TO JONATHAN BONNEY, CHAS. BUSH AND GEO. G. LOBDELL, WILMINGTON, NEW-CASTLE COUNTY, DELAWARE, MARCH 17TH, 1838.

To all whom it may concern: Be it known that we, Jonathan Bonney, Charles Bush, and George G. Lobdell, of Wilmington, in the county of New-Castle, and State of Delaware, have invented an improvement in the manner of constructing cast iron wheels for cars, to be used on railroads, and for other purposes; and we do hereby declare that the following is a full and exact description thereof. The accompanying drawing shows a section of one wheel, which, instead of arms as usually employed, has each face thereof convex, a hollow space being left between the two surfaces.

The rim of the wheel A, A, does not differ from those usually employed, and is cast in a chill in the ordinary manner. The rim is united to the centre, or hub, of the wheel B, B, by the two convex faced plates C, C, which are cast in one piece with the rim and hub. The interior D, D, between the two convex face plates, is formed by cores, supported in a way well known to iron founders. The hub has a transverse division E, E, which separates it into two distinct parts, attached respectively to the face plates. This division is necessary to prevent the tension which would be produced by shrinkage in the casting, and which would endanger the breaking of the wheel. The hub, if preferred, may be cast solid, with the exception of the division E, and afterwards bored out; or it may be cored and turned to receive the axle.

We are aware that wheels have been made with double convex plates, both of cast, and of wrought iron; but such plates were in separate pieces from the rims and hubs, being received into rebates on the rims, and embracing the hub between them, which extended through openings in their centres, the two plates being secured together by screw bolts; we are also aware that a plan has been devised for casting iron wheels with two face plates, having a space between them formed by cores, as in our method, but the two plates were in this case parallel to each other, one of them being convex, and the other concave, on its face, the hub extending from one face to the other in a continuous piece, rendering it necessary, on account of shrinkage, to place the two plates as described; an arrangement which sacrificed strength to necessity.

By constructing the wheel so that the plates shall both be convex outwards, as they are, in the position of the greatest strength, they may be made considerably thinner than would otherwise be admissible, and the wheel will consequently be lighter.

All that we claim as our invention, is the division of the hub into two parts, transversely, between two face plates each convex outwardly, in the manner, and for the purpose, set forth.—*Jour. Franklin Inst.*